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PTO/SB/97 (08-03)

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APPLICATION NUMBER: 10/605,377

PAPERS INCLUDED:

| | |
|--------------------------------------|----------|
| (1) Transmittal Form | 1 PAGE |
| (2) Fee Transmittal | 1 PAGE |
| (3) Information Disclosure Statement | 29 PAGES |

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| TRANSMITTAL FORM (to be used for all correspondence after initial filing) | Application Number | 10/605,377 | |
| | Filing Date | 09/25/2003 | |
| | First Named Inventor | Jun-Cheng Lai | |
| | Art Unit | 1752 | |
| | Examiner Name | | |
| Total Number of Pages in This Submission | 31 | Attorney Docket Number | LKSP0022USA |

| ENCLOSURES (Check all that apply) | | |
|--|---|---|
| <input checked="" type="checkbox"/> Fee Transmittal Form | <input type="checkbox"/> Drawing(s) | <input type="checkbox"/> After Allowance communication to Technology Center (TC) |
| <input type="checkbox"/> Fee Attached | <input type="checkbox"/> Licensing-related Papers | <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences |
| <input type="checkbox"/> Amendment/Reply | <input type="checkbox"/> Petition | <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) |
| <input type="checkbox"/> After Final | <input type="checkbox"/> Petition to Convert to a Provisional Application | <input type="checkbox"/> Proprietary Information |
| <input type="checkbox"/> Affidavits/declaration(s) | <input type="checkbox"/> Power of Attorney, Revocation | <input type="checkbox"/> Status Letter |
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| SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT | |
| Firm or Individual name | Winston Hsu, Reg. No.: 41,526 |
| Signature | <i>Winston Hsu</i> |
| Date | 8/17/2004 |

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FROM: Winston Hsu, PATENT AGENT, REG. NO. : 41,526

SERIAL NO.: 10/605,377

ATTORNEY DOCKET NO.: LKSP0022USA

SUBJECT: INFORMATION DISCLOSURE STATEMENT

TOTAL PAGES: 33 PAGES (INCLUDING COVER PAGE)

Winston Hsu 2004/08/17

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AUG 17 2004

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Jun-Cheng Lai

5 Filing Date: 09/25/2003

Art Unit: 1752

Serial No.: 10/605,377

Docket No.: LKSP0022USA

OFFICIAL

10 Title: METHOD OF IMPROVING A RESOLUTION OF CONTACT
HOLE PATTERNS BY UTILIZING ALTERNATE PHASE
SHIFT PRINCIPLE

To: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

15

Subject: Information disclosure statement Under
37C.F.R. §1.56 and 37C.F.R. §1.97(b).

Dear Sir:

20

25 This is an Information Disclosure Statement in
accordance with the duty to disclose information
material to patentability under 37 C.F.R. §1.56.
Applicants wish to make of record the document listed
on the accompanying form PTO/SB/08. It is respectfully
requested that the Examiner initials the cited
reference on the form and that it be made of record
in the application and that a copy of the initialed
form be sent to Applicants with the next communication
30 from the Examiner.

Since the information disclosure statement is filed

before the mailing of a first Office action on the merits, the requirement set forth in 37 C.F.R. §1.97(b)(3) is satisfied. The prior art patent contained in the information disclosure statement was
5 cited in communications from the Taiwan Intellectual Property Office on 06/08/2004. Applicant sincerely hopes that the examiner can consider the item contained in the information disclosure statement.

10 According to the requirement set forth in 37 C.F.R. §1.98 and M.P.E.P. 609, the applicant is submitting copies of the reference cited by the Taiwan Intellectual Property Office (Taiwan Patent No. 423048, published Feb. 21, 2001) and a concise explanation of
15 the relevance in this application hereinafter.

Taiwan Patent No. 423048 discloses forming a plurality of interconnection patterns 50 having good resolution by utilize an alternating phase shift mask
20 (Please refer to Fig.1 and Fig.2). On the alternating phase shift mask, light permeable regions 20 and light permeable regions 30, having a thickness different from a thickness of the light permeable regions 20, are surrounded by an opaque region. The opaque region
25 comprises interconnection line patterns in the shape of a line and a peripheral protection region. Due to the difference between the thickness of the light permeable regions 20 and 30, light passing through the light permeable regions 20 has a phase shift of 180
30 degrees relative to light passing through the light permeable regions 30. Under the circumstances, diffraction lights are cancelled out from each other

at the edge of the interconnection patterns 50 to improve a resolution between the adjacent interconnection patterns 50.

5 Independent claims 1 and 9 of the present application are repeated here for reference:

1. A lithography method for forming a plurality of closed patterns in a photoresist layer on a substrate,
10 the patterns being isolated from each other and being arranged in an array, the lithography method comprising:

providing a phase shift mask (PSM), wherein the phase shift mask comprises:

15 a plurality of first phase shift transparent regions;

a plurality of second phase shift transparent regions having a phase shift relative to the first phase shift transparent regions; and

20 a non-phase shift region, **wherein the first phase shift transparent regions and the second phase shift transparent regions are regularly interlaced in an array**, and each of the first phase shift transparent regions and each of the second
25 phase shift transparent regions are separated by the non-phase shift region; and

performing an exposure process **to form the closed patterns in the photoresist layer**, wherein the closed patterns are corresponding to the first phase shift
30 transparent regions and the second phase shift transparent regions.

9. A lithography method for forming a plurality of closed patterns in a photoresist layer on a substrate, the patterns being isolated from each other and being arranged in an array, the lithography method
- 5 comprising:
- providing a phase shift mask (PSM), wherein the phase shift mask comprises:
- a plurality of first phase shift transparent regions;
- 10 a plurality of second phase shift transparent regions having a phase shift relative to the first phase shift transparent regions; and
- a non-phase shift region, wherein portions of
- 15 the first phase shift transparent regions and portions of the second phase shift transparent regions are regularly interlaced in an array, and each of the first phase shift transparent regions and each of the second phase shift transparent regions are separated by the non-phase shift region;
- 20 and
- performing an exposure process to form the closed patterns in the photoresist layer, wherein the closed patterns are corresponding to the first phase shift transparent regions and the second phase shift
- 25 transparent regions.

Compared with Taiwan Patent No. 423048, the present application method of forming the closed patterns in the photoresist layer is to utilize a phase shift mask

30 having the first phase shift transparent regions and the second phase shift transparent regions regularly interlaced in an array. Because the first phase shift

transparent regions and the second phase shift transparent regions are regularly interlaced in an array, diffraction lights are cancelled out from each other along two dimensions to form the closed patterns.

5 In Taiwan Patent No. 423048, the light permeable regions 20 and the light permeable regions 30 are regularly interlaced along one dimension. Therefore, the diffraction lights, canceling out from each other at the edge of the interconnection patterns 50, are
10 only along one dimension. In other words, it is impossible to form closed patterns having a good resolution according to the method disclosed by Taiwan Patent No. 423048.

15 In summary, the method disclosed by the present application is able to form closed patterns. The method disclosed by Taiwan Patent No. 423048 can only form interconnection line patterns rather than the closed patterns, such as contact hole patterns and a logic cell
20 patterns of a logic circuit.

Since claims 1 and 9 of the present application are substantially different from the prior art patent Taiwan Patent No. 423048, and all other claims are
25 dependent on claims 1 and 9, a quick allowance of the present application is sincerely requested.

30

Respectfully Submitted,

5 Winston Hsu

Date:

8/17/2004

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communication and I will return your call promptly.)

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(Use as many sheets as necessary)

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Complete if Known

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| Application Number | 10/605,377 |
| Filing Date | 09/25/2003 |
| First Named Inventor | Jun-Cheng Lai |
| Art Unit | 1752 |
| Examiner Name | |
| Attorney Docket Number | LKSP0022USA |

U. S. PATENT DOCUMENTS

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FOREIGN PATENT DOCUMENTS

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**Examiner
Signature**

| Date | Considered |
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| 10/1/80 | 10/1/80 |
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| 10/31/80 | 10/31/80 |

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